

CLAIMS

What is claimed is:

- 1 1. A method of establishing a secure wireless communications channel between an
2 access point and a station, the channel being encrypted with a channel key, the method
3 comprising:
4 sending, by the station to the access point, a request for a security preference for
5 the access point;
6 sending, by the access point to the station, the security preference in response to
7 the request when the access point can support the channel;
8 generating, by the station, authentication information using a first key when the
9 security preference is shared key;
10 sending, by the station to the access point, the authentication information;
11 validating, by the access point, the station using the authentication information;
12 encrypting, by the access point, the channel key using a second key when the
13 station is validated;
14 sending, by the access point to the station, the encrypted channel key;
15 decrypting, by the station, the channel key in response to receiving the encrypted
16 channel key; and
17 sending, by the station to the access point, data encrypted with the channel key to
18 establish the channel.

1 2. The method of claim 1, wherein the first and second keys are a self-distributed
2 key.

1 3. The method of claim 2, further comprising:
2 generating, by the access point, the self-distributed key using a security algorithm
3 when the security preference is shared key;
4 generating, by the station and sending to the access point, a first value using the
5 security algorithm in response to receiving the security preference of shared key;
6 generating, by the access point, and sending to the station, a second value using
7 the security algorithm and the first value in response to receiving the first value; and
8 calculating, by the station, the self-distributed key using the security algorithm and
9 the second value in response to receiving the second value.

1 4. The method of claim 3, wherein the security algorithm is $g^n \bmod p$ and further
2 comprising:
3 obtaining, by the access point, integers x , g and p to generate the self-distributed
4 key $k = g^x \bmod p$;
5 obtaining, by the station, the integers g and p , and an integer y to generate the first
6 value $Y = g^y \bmod p$;
7 generating, by the access point, the second value $X = Y^x \bmod p$; and
8 setting, by the station, z equal to y^{-1} to calculate the self-distributed key
9 $k = X^z \bmod p$.

1 5. The method of claim 4 wherein obtaining, by the station, the integers g and p
2 comprises:

3 sending, by the access point to the station, the integers for g and p .

1 6. The method of claim 5, wherein the integers for g and p are sent to the station
2 when the security preferences are sent by the access point.

1 7. The method of claim 5, wherein the integers for g and p are sent to the station
2 when a user name and password for the station are registered with the access point.

1 8. The method of claim 4 further comprising:
2 publishing, by the access point, the integers g and p for a set of stations.

1 9. The method of claim 2 further comprising:
2 encrypting, by the station, a name and password with the first key to generate the
3 authentication information; and

4 decrypting, by the access point, the name and password to validate the station.

1 10. The method of claim 2 further comprising:
2 sending, by the access point to the station, a challenge;
3 encrypting, by the station, the challenge with the first key to generate the
4 authentication information;
5 encrypting, by the access point, the challenge with the first key; and

6 comparing, by the access point, the authentication information with the challenge
7 encrypted by the access point with the first key to validate the station.

1 11. The method of claim 1, wherein the first key is a public key of a public-private
2 key pair for the access point, and the second key is a public key of a public-private key
3 pair for the station.

1 12. The method of claim 11 further comprising:
2 sending, by the access point to the station, the first key; and
1 sending, by the station to the access point, the second key.

1 13. The method of claim 12, wherein the second key is sent to the access point when
2 the request for the security preference is sent by the station.

1 14. The method of claim 12, wherein the first key is sent to the station when the
2 security preference is sent by the access point.

1 15. The method of claim 1, wherein establishing the channel creates a standard wired
2 equivalent privacy (WEP) network, and the station and the access point exchange
3 messages conforming to a format required by the standard that defines a WEP network to
4 establish the WEP network.

1 16. A method for connecting a station to a secure wireless network comprising:

2 sending a request for a security preference to an access point for the secure
 3 wireless network;
 4 generating authentication information for the station when the station receives a
 5 security preference specifying shared key from the access point;
 6 sending the authentication information to the access point;
 7 decrypting a channel key in response to receiving an encrypted channel key from
 8 the access point; and
 9 sending data encrypted with the channel key to the access point.

1 17. The method of claim 16 further comprising:

1 generating a first value using a security algorithm in response to receiving the
 2 security preference specifying shared key from the access point;
 3 calculating a self-distributed key using the security algorithm and a second value
 4 in response to receiving the second value from the access point; and
 5 using the self-distributed key to generate the authentication information and to
 6 decrypt the encrypted channel key.

1 18. The method of claim 17, wherein the security algorithm is formulated as $g^n \bmod p$
 2 and further comprising:

3 obtaining integers for y , g and p to generate the first value $Y = g^y \bmod p$; and
 1 setting z equal to y^{-1} to calculate the self-distributed key $k = X^z \bmod p$.

1 19. The method of claim 16 further comprising:

2 using a first key to generate the authentication information; and
3 using a second key to decrypt the encrypted channel key.

1 20. The method of claim 19, wherein the first key is a public key of a public-private
2 key pair for the access point, and the second key is a private key of a public-private key
3 pair for the station.

1 21. A method of securing a wireless network at an access point comprising:
2 sending a security preference in response to a request from a station;
3 validating the station in response to receiving authentication information from the
4 station;
5 encrypting a channel key when the station is validated;
6 sending the encrypted channel key to the station; and
7 sending data encrypted with the channel key to the station.

1 22. The method of claim 21 further comprising:
2 generating a self-distributed key using a security algorithm when the security
3 preference is shared key;
4 generating a second value using the security algorithm and a first value in
5 response to receiving the first value from the station; and
6 sending the second value to the station.

1 23. The method of claim 22, wherein the security algorithm is formulated as $g^n \bmod p$
2 and further comprising:
3 obtaining integers x , g and p to generate the self-distributed key $k = g^x \bmod p$; and
4 generating the second value $X = Y^x \bmod p$.

1 24. The method of claim 21 further comprising:
1 using a first key to evaluate the authentication information; and
2 using a second key to encrypt the encrypted channel key.

1 25. The method of claim 24, wherein the first key is a private key of a public-private
2 key pair for the access point, and the second key is a public key of a public-private key
3 pair for the station.

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1 26. A computer-readable medium having stored thereon executable instructions to
2 cause a processor to perform a station method to connect to a secure wireless network, the
3 instructions comprising:
4 sending a request for a security preference to an access point for the secure
5 wireless network;
6 generating authentication information for the station when the station receives a
7 security preference specifying shared key from the access point;
8 sending the authentication information to the access point;
9 decrypting a channel key in response to receiving an encrypted channel key from
10 the access point; and

11 sending data encrypted with the channel key to the access point.

1 27. The computer-readable medium of claim 26 having further instructions

2 comprising:

1 generating a first value using a security algorithm in response to receiving the

2 security preference specifying shared key from the access point;

3 calculating a self-distributed key using the security algorithm and a second value

4 in response to receiving the second value from the access point; and

5 using the self-distributed key to generate the authentication information and to

6 decrypt the encrypted channel key.

1 28. The computer-readable medium of claim 27, wherein the security algorithm is

2 formulated as $g^n \bmod p$ and having further instructions comprising:

3 obtaining integers y , g and p to generate the first value $Y = g^y \bmod p$; and

1 setting z equal to y^{-1} to calculate the self-distributed key $k = X^z \bmod p$.

1 29. The computer-readable medium of claim 26 having further instructions

2 comprising:

3 using a first key to generate the authentication information; and

4 using a second key to decrypt the encrypted channel key.

1 30. The computer-readable medium of claim 29, wherein the first key is a public key
2 of a public-private key pair for the access point, and the second key is a private key of a
3 public-private key pair for the station.

1 31. A computer-readable medium having stored thereon executable instruction to
2 cause a processor to perform an access point method to secure a wireless network, the
3 instructions comprising:
4 sending a security preference in response to a request from a station;
5 validating the station in response to receiving authentication information from the
6 station;
7 encrypting a channel key when the station is validated;
8 sending the encrypted channel key to the station; and
9 sending data encrypted with the channel key to the station.

1 32. The computer-readable medium of claim 31 having further instructions
2 comprising:
3 generating a self-distributed key using a security algorithm when the security
4 preference is shared key;
5 generating a second value using the security algorithm and a first value in
6 response to receiving the first value from the station; and
7 sending the second value to the station.

- 1 33. The computer-readable medium of claim 32, wherein the security algorithm is
2 formulated as $g^n \bmod p$ and having further instructions comprising:
1 obtaining integers x , g and p to generate the self-distributed key $k = g^x \bmod p$; and
2 generating the second value $X = Y^x \bmod p$.
- 1 34. The computer-readable medium of claim 31 having further instructions
2 comprising:
1 using a first key to evaluate the authentication information; and
2 using a second key to encrypt the encrypted channel key.
- 1 35. The computer-readable medium of claim 34, wherein the first key is a private key
2 of a public-private key pair for the access point, and the second key is a public key of a
3 public-private key pair for the station.
- 1 36. A secure wireless network comprising:
2 an access point operable for receiving a connection request from a station through
3 a setup connection, for validating authentication information sent by the station, and for
4 connecting the station to the network through a channel secured with a shared channel
5 key; and
6 a station operable for sending the connection request to the access point, and for
7 generating the authentication information to send to the access point.

1 37. The secure wireless network of claim 36, wherein the access point is further
2 operable for sending a security preference specifying shared key to the station upon
3 receiving the connection request, and the station is operable for sending the authentication
4 information to the station upon receiving a security preference specifying shared key.

1 38. The secure wireless network of claim 37, wherein the access point is further
2 operable for encrypting the shared channel key using a self-distributed key for sending to
3 the station and the station is further operable for decrypting the shared channel key upon
4 receipt.

1 39. The secure wireless network of claim 38, wherein the station and the access point
2 are further operable for calculating the self-distributed key by exchanging messages in
3 accordance with the Hughes transmission protocol

1 40. The secure wireless network of claim 36, wherein the station is further operable
2 for using a first key to generate the authentication information and for using a second key
3 to decrypt an encrypted shared channel key received from the access point, and the access
4 point is further operable for using a third key to evaluate the authentication information
5 and for using a fourth key to encrypt the shared channel key for sending to the station.

1 41. The secure wireless network of claim 40, wherein the first and third keys are
2 public and private keys, respectively, for the access point, and the second and fourth keys
3 are private and public keys, respectively, for the station.

1 42. A computer-readable medium having stored thereon a message data structure for a
2 secure wireless network comprising:

3 a station address field containing data representing an identifier for a station that
4 exchanges messages with an access point on the secure wireless network;

5 a transaction sequence number field containing data representing a sequence
6 number for a message exchanged between the station identified by the station address
7 field and the access point;

8 an authentication algorithm field containing data representing an identifier for a
9 protocol used by the access point to validate the station identified by the station address
10 field based on a name and password for the station; and

11 a dependent information field containing data required to connect the station
12 identified by the station address field to the secure wireless network.

1 43. The computer-readable medium of claim 42, wherein the data in the dependent
2 information field represents key information for encrypting the name and password for
3 the station identified by the station address field.

1 44. The computer-readable medium of claim 42, wherein the data in the dependent
2 information field represents an encrypted name and password for the station identified by
3 the station address field.

- 1 45. The computer-readable medium of claim 42, wherein the data in the dependent
- 2 information field represents an encrypted channel key used to connect the station
- 3 identified by the station address field to the secure wireless network.

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